

SECTION 02660

WATER DISTRIBUTION

1. PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Lower Existing Water Main.
- B. Lower Existing Water Service.
- C. Support Existing Fire Hydrant.
- D. Remove and Reset Existing Fire Hydrant.
- E. Abandon and Fill Existing Water Main.
- F. Water Main Construction.
- G. Blow Off Hydrant Assembly.

1.2 RELATED SECTIONS

- A. Section 02211 - Rough Grading: Top soil removal.
- B. Section 02223 - Backfilling: Fill material.
- C. Section 02225 - Trenching: Excavation and backfilling.

1.3 REFERENCES

- A. ASME B16.1 – Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.
- B. AWWA C110 – Ductile – Iron and Gray – Iron Fittings 3 inch through 48 inch, for Water and Other Liquids.
- C. ASME B16.26 – Cast Bronze Fittings for Flared Copper Tubes.
- D. ASTM B88 – Seamless Copper Water Tube.
- E. AWWA C500 – Gate Valves for Water and Sewerage Systems.
- F. AWWA C502 – Dry-Barrel Fire Hydrants.
- G. AWWA C509 – Resilient Seated Gate Valves for Water and Sewerage Systems.
- H. AWWA C651 – Disinfection Water Mains.
- I. ANSI/AWWA C153/A21.53-94 – Ductile-Iron Compact fittings, 3 inch through 24 inch and 54 inch through 64 inch for water service.
- J. ANSI A21.11/AWWA C111 – Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

- K. ANSI A21.51/AWWA C151 – Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water and Other Liquids.
- L. ANSI A21.4-95/AWWA C104 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

1.4 UNIT PRICE – MEASUREMENT AND PAYMENT

- A. Lower Existing Water Main:
  - 1. Basis of Measurement: At the unit price bid per each as stated in the proposal.
  - 2. Basis of Payment: Includes all material, labor, and equipment required to excavate, lower or relocate existing water main and valve boxes and backfill as shown on the plans.
- B. Lower Existing Water Service:
  - 1. Basis of Measurement: At the unit price bid per each as stated in the proposal.
  - 2. Basis of Payment: Includes all material, labor, and equipment required to excavate, lower or relocate existing water services, valve boxes, and backfill as shown on the plans.
- C. Support Existing Fire Hydrant:
  - 1. Basis of Measurement: Included in the unit price bid for item being installed.
  - 2. Basis of Payment: Includes all labor, materials, and equipment necessary to support existing fire hydrant during construction.
- D. Remove and Reset Existing Fire Hydrant:
  - 1. Basis of Measurement: At the unit price bid per each as stated in the proposal.
  - 2. Basis of Payment: Includes all labor, materials and equipment necessary to remove, reset, provide thrust blocks, and backfill for existing fire hydrant relocation.
- E. Abandon and Fill Existing Water Main:
  - 1. Basis of Measurement: At the unit price bid per lineal foot as stated in the proposal.
  - 2. Basis of Payment: Included all the labor, materials, and equipment necessary to fill in the water main with material.
- F. Water Main Construction:
  - 1. Basis of Measurement: At the unit price bid per lineal foot as stated in the proposal.
  - 2. Basis of Payment: Includes labor, material, and equipment to perform the following operations: hand trimming, excavating, bedding, backfilling, pipe and fittings, testing, and complete installation as stated in the specifications and indicated on the drawings.
- G. Blow Off Hydrant Assembly:
  - 1. Basis of Measurement: At the unit price bid each as stated in the proposal.
  - 2. Basis of Payment: Includes all labor, material, and equipment to install the tapped plug, curb stop and box, copper pipe and adaptor fittings. This installation will be installed as prescribed in the Delta Township water/waste water Installation Standards.

1.5 GENERAL

- A. The Work to be done under this Contract consists of the construction of water main with appurtenances.

- B. The Contractor shall furnish all labor, tools, equipment and materials, except as noted herein, required for the construction as shown on the plans or called for in the specifications.
- C. The Owner will not furnish miscellaneous materials such as sand, concrete, or similar items required for water main construction.
- D. Working hours for construction of this project shall be from 7:00 a.m. until 7:00 p.m., Monday through Saturday. No work shall happen on Sundays or holidays. In an emergency or as directed by the Owner or Engineer other hours may be acceptable.
- E. Final restoration and cleanup for this project shall meet the approval of Delta Charter Township, the Engineer, and the Owner. The Engineer and the Owner in conjunction with Delta Charter Township shall get final acceptance of the restoration and cleanup.

#### 1.6 SUBMITTALS

- A. Submit under provisions of Section 01300 - Submittals.
- B. Submit shop drawings and product data for all items to be installed and/or constructed within this Section.
- C. Product data shall include data on pipe materials, pipefittings, and accessories not furnished by the Township. Provide manufacturer's catalog information.

#### 1.7 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700 - Contract Closeout.
- B. Record actual locations of valves.

#### 1.8 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01700 - Contract Closeout.
- B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

#### 1.9 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Pipe: Marked according to AWWA and NSF Standards.

#### 1.10 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five years documented experience.
- B. Contractor/Installer: Company specializing in performing the work of this Section with minimum five years experience.

#### 1.11 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with Delta Charter Township standards.

1.12 CONTROL OF VALVES AND HYDRANTS

- A. Coordinate the shutdown of the water main with Delta Charter Township.
- B. Possess in tool inventory, the proper valve and hydrant wrenches.
- C. Use of pipe wrench, monkey wrench, or open-end type wrench is prohibited on valves and hydrants.
- D. Only operate valves in case of emergency. All other times, valves shall only be operated by Delta Charter Township.

2. PART 2 PRODUCTS

2.1 WATER MAIN PIPE

- A. All ductile iron material, used for water main construction within Delta Charter Township, shall be made in the United States.
- B. Ductile Iron Pipe:
  - 1. All water main shall be Class 52 Ductile Iron Pipe conforming to ANSI A21.50 and A21.51 unless otherwise indicated on the plans. The pipe shall have cement mortar lining conforming to ANSI A21.4 and an exterior coating of bituminous seal coat one mil thick. Joints shall be the push-on type conforming to ANSI A21.11. In addition the pipe shall meet the following specifications of the American Water Works Association:
    - a. AWWA C 151 for Ductile Cast Iron Pipe
    - b. AWWA Manual H3 for Ductile Iron Pipe Wall Thickness
    - c. AWWA C 104 for Cement Mortar Lining
    - d. AWWA C 111 for Mechanical Joint Detail
  - 2. The lubricant furnished to facilitate assembly of the joints shall be non-toxic, tasteless and odorless, and must not support the growth of bacteria nor have a deleterious effect on the rubber gasket.
- C. Fittings:
  - 1. All fittings furnished shall meet or exceed the following applicable specifications:
    - a. ANSI/AWWA C153/A21.53-94 or ANSI/AWWA C110/A21.10-93 for Fittings
    - b. AWWA C104 for Cement Mortar Lining
    - c. AWWA C111 for Mechanical Joint Detail
  - 2. Fittings shall be mechanical joint ductile iron conforming to ANSI A21.10 with cement mortar lining conforming to ANSI A21.4. Glands, gaskets and bolts shall be provided for each bell opening. Fittings shall be rated at 250 psi working pressure and shall be coated outside with a bituminous seal coat 1 mil thick.
- D. Valves:
  - 1. Valves up to 12 inch diameter shall be cast iron body, bronze mounted, double disk with parallel seat conforming to A.W.W.A. C 500 such as Traverse City Iron Works A-230-MM-O or approved equal. Resilient seated wedge gate valves conforming to AWWA C509-80 by Clow Corporation, Waterous, or approved equal, are also acceptable.

2. Valves larger than 12 inch diameter shall be cast iron body, bronze mounted, double disk with parallel seat conforming to AWWA C 500 such as Traverse City Iron Works A-230-MM-O or approved equal. Resilient seated wedge gate valves conforming to AWWA C509-80 by Clow Corporation, Waterous, or approved equal, are also acceptable.
  3. Butterfly valves shall be cast iron body conforming to AWWA C 504 such as Traverse City Iron Works, Henry Pratt Company or approved equivalent. Butterfly valves shall have a 150 pound per square inch rating with the seat molded, vulcanized and bonded to the body. Butterfly valves shall have cast iron body with mechanical joint ends and glands, gaskets and bolts provided for each end.
  4. Gates valves shall have a cast iron body with mechanical joint ends and glands, gaskets and bolts provided for each end.
  5. Stem seals shall be of the double O-ring design and shall be capable of being replaced while the valve is fully open and under pressure.
  6. Valve stems shall be non-rising.
  7. Valves shall open left.
- E. Valve Boxes:
1. Valve boxes shall be Traverse City Iron Works A-295 with A-295-D6 base, or approved equivalent.
  2. Valve boxes shall be cast iron, screw type, three piece, consisting of the base, center section and top section. The cast iron list shall be marked "WATER."
  3. The valve boxes shall be of the proper length to be flush with the ground surface when installed over a valve attached to a pipe with 5 to 6 feet of cover.
- F. Retainer Glands:
1. Retainer glands shall be made of high strength ductile iron and fitted with cup point, square head, double heat treated, steel set screws. The retainer glands shall also utilize standard tee head bolts and a gasket conforming to ANSI A21.11.
- G. Fire Hydrants:
1. Fire hydrants shall be manufactured in conformance with the requirements of the AWWA Standard C-502.
  2. The hydrants shall be of the proper length for installation with a pipe under 5 feet of cover.
  3. The hydrant valve shall be 5-1/4 inch in diameter.
  4. Each hydrant shall have two 2-1/2 inch National Standard hose connections. Each hydrant shall have one 4 inch (4-7/8 inch O.D. with 6 threads per inch) pumper connection.
  5. The operating nut shall be the National Standard 1-1/2 inch pentagonal.
  6. The hydrant shall open by turning left (counter-clockwise).
  7. Hydrants shall be Traverse City Iron Works Model TVC H-1-M or East Jordan Iron Works Model 5BR and shall be bright yellow in color with the optional brass liner.

## 2.2 CORROSION PROTECTIVE MATERIAL

- A. Coatings: To be applied to buried nuts, bolts, threaded rod and flanges, including those used for flanged, mechanical and restrained joints.
1. Manufacturers:
    - a. San Chem, Inc., 1600 South Canal Street, Chicago, Illinois 60616.
      1. Product: NO-OXG-GG-2
    - b. Coronado Paint Product: Coal Tar Epoxy, 10 mil (DMT)
    - c. Or equal.

- B. Polyethylene Wrap: All water main pipe, fittings and valves installed in a trench shall be encased within 8 mil thick polyethylene tube conforming to ANSI A21.P. Installation shall be in accordance with the manufacturer's recommendation. Closures and damaged areas shall be sealed with 1-1/2 inch by 12 mil polyethylene adhesive tape.

3. PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that excavations are to required grade, dry and not over-excavated.
- B. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

- A. Hand trim trench excavation to required elevations. Correct undercutting with compacted MDOT 6A crushed stone at no additional cost.
- B. Remove large stones or other hard matter, which could damage pipe.

3.3 WATER MAIN CROSSING WATERCOURSES

- A. Water mains crossing County drains shall be made in dry trench conditions and shall conform to the requirements of the Delta Charter Township.

3.4 CONNECTION TO EXISTING WATER MAIN

- A. The Contractor shall connect the proposed water main to the existing water main as shown on the plans or as directed by the Engineer.
- B. The Contractor shall locate the existing water main prior to construction of the proposed water main and shall furnish and install the necessary fittings, including tees, bends, crosses, cutting-in-sleeves, pipe and/or adaptors as necessary to complete the connection.

3.5 CROSSING EXISTING UTILITIES

- A. Where gas mains and services, water mains and services, sewers or any underground utilities cross the trench in open cut, compacted sand backfill shall be required to bed the crossing line.
- B. The sand backfill shall extend to 4 inches above the top of the pipe or conduit, which is being supported.
- C. In addition to the sand backfill it may be necessary to support the pipe crossing the trench with a 6 inch x6 inch timber with ends supported on solid earth at both sides of the trench.
- D. When supporting pipes with collars or bell joints, the timber shall be placed 3 inches below such collars or bells and the barrel of the pipe supported with hardwood blocking at 3 foot centers.
- E. The cost of sand backfill used for supporting cross trench piping and the timber supports shall be considered incidental to the project.

- 3.6 BACKFILLING
- A. Refer to Section 02223 - Backfilling.
- 3.7 DISPOSAL OF FLUSHING WATER
- A. The Contractor shall provide outlets to existing drainage for flushing purposes.
- 3.8 WATER COST
- A. The Contractor shall pay for all water used during construction, including water main breaks and water necessary for testing, cleaning, and chlorinating water mains.
- B. The actual volume of water used shall be determined by the Engineer.
- C. The rate of pay for all water used shall be at the current rate per 1,000 gallons.
- D. The water necessary to fill the volume of the water main at the completion of the Project shall be paid by the Owner.
- 3.9 MAINTAINING WATER SERVICE
- A. The Contractor shall coordinate any proposed interruptions in the existing water system with both the Owner and Engineer.
- B. If any portions of the existing water mains cannot remain in service due to construction of the proposed water mains, the Contractor shall extend a temporary 1-1/4 inch polyethylene service to each customer affected by the outage.
- C. The cost of these temporary connections, if required, shall be included in all other items of the Contract.
- D. Services shall be reconnected to the existing water main.
- 3.10 JOINTING
- A. Mechanical Joints: Make joints in accordance with manufacturer's instructions.
- B. Push-on Joints: Make joints in accordance with manufacturer's instructions.
- C. Flanged Joints: Make joints in accordance with manufacturer's instructions.
- D. Restrained joints: Make joints in accordance with Delta Charter Township requirements and manufacturer's instructions.
- 3.11 INSTALLATION - PIPE, FITTINGS AND ACCESSORIES
- A. Install pipe, fittings and accessories in accordance with manufacturer's instructions.
- B. Install to the line and elevations shown on the plans.
- C. Water Main shall have a minimum cover of 5 feet from proposed finish grade. Unless shown otherwise on the plans or directed by the Engineer.
- D. Prepare trench and bedding as specified in Section 02225 – Trenching.

- E. Hand trim for bell and spigot pipe joints.
- F. Carefully lay the pipe on the bedding to insure positive bearing along the full length of the pipe.
- G. Restrain pipe and fittings as described in the Delta Charter Township Standards, or as described in the pipe restraint schedule.
- H. Before placing water main in service, the main shall be cleaned with a pigging process. Method shall be approved by Engineer prior to use.
- I. Verify joints are installed according to Section 3.10, Jointing.

### 3.12 BLOCKING

- A. All bends of the system, which may be subject to separation of the joints because of internal pressures shall be securely blocked or braced. Blocking shall be MDSH Grade 30M concrete poured in place. The concrete shall be placed to prevent any movement of the pipe and fittings due to internal pressure.
- B. Concrete thrust blocks shall be placed at all 22-1/2 degree bends or greater.
- C. In all cases, thrust block size and method of thrusting shall follow the plans and must be approved by the Engineer before the thrust block is poured.
- D. Bracing shall be through the use of fittings with lugs and tie-rods.
- E. Thrust blocks shall extend from the fitting to undisturbed earth.
- F. Thrust block bearing area shall be adequate for the soil bearing pressure as provided in the Delta Township Standards.

### 3.13 POLYETHYLENE ENCASEMENT

- A. Install in accordance with manufacturer's instructions and AWWA C105-93.
- B. Install to prevent contact between ductile iron pipe, fittings, valves and hydrants and the surrounding backfill and bedding material.
- C. Encasement is not intended to be a completely airtight nor water tight enclosure.
- D. Overlap joints a minimum of 18 inches and secure with adhesive tape or plastic string for the purpose of holding polyethylene in place until backfilling operations are complete.
- E. Encase valves up to the operating nut without interfering with valve operation.
- F. Encase hydrants to the grade line.
- G. Repair rips, punctures and other damage with 1-1/2 inch by 12 mil polyethylene adhesive tape.

### 3.14 INSTALLATION - HYDRANTS

- A. Install in accordance with manufacturer's instructions and Delta Charter Township requirements.

- B. Verify the weep hole is open and will properly drain the hydrant when the hydrant is closed.
- C. Set at plan location and grade such that the hose nozzles are 21 inches above grade at that location.
- D. Excavate a minimum 12 inches below the base of the hydrant and a minimum of 24 inches in diameter. Fill the excavation to the base of the hydrant with MDOT 6A coarse aggregate.
- E. Block hydrant against undisturbed earth and secure to the main line with two 3/4 inch threaded rods or retainer glands. Place 8 mil polyethylene between the blocking and the hydrant.
- F. Place an additional 12 inches of MDOT 6A coarse aggregate around the base of the hydrant. Aggregate for hydrant installation shall be natural stone.
- G. Duc-Lugs and/or Eye Bolts, as manufactured by Continental Eastern, Romac Industries or equal may be used with rods as a means of restraint.
- H. Set plumb.
- I. Rotate up to 180 degrees for the pumper connection to face the road, unless otherwise directed by the Engineer.
- J. Install blow off assembly according to the Delta Township Standards.
- K. Set only when the Engineer is present.
- L. Obtain approval of the Engineer prior to backfilling.
- M. Backfill according to Section 02223 - Backfilling.

### 3.15 INSTALLATION - VALVES

- A. Install in accordance with manufacturer's instructions and Delta Charter Township requirements.
- B. Tighten nuts on valve body.
- C. Set plumb on a 4 inches x 8 inches x 16 inches concrete block. Use larger blocks for larger valves.
- D. Backfill with Type A material to a minimum of 2 inches above the flange of the valve dome.
- E. Leave valves in the open position except for the valves that connect to the existing water main.

### 3.16 INSTALLATION - VALVE BOXES

- A. Set base on Type A material a minimum of 2 inches above the flange on the valve dome and centered over the operating nut. Backfill to finish subgrade according to Section 02223 - Backfilling.
- B. Set box plumb and centered over the valve-operating nut.

- C. Adjust the top of the valve box to match proposed finish grade.
- D. Install extensions for trench depth greater than 6 feet 6 inches.

3.17 INSTALLATION - TAPPING SLEEVES AND VALVES

- A. Install in accordance with manufacturer's instructions.
- B. Install valve in accordance with provisions of paragraph 3.15, Installation - Valves.

3.18 RELOCATING EXISTING HYDRANTS

- A. Relocate existing hydrants as noted on the drawings.
- B. Remove hydrant, horizontal pipe lead and hydrant valve and box.
- C. Plug and block existing water main at hydrant tee.
- D. Re-install hydrant and valve according to paragraph 3.14, Installation Hydrants and 3.15, Installation Valves.
- E. Replace or repair material damaged during relocation operation.
- F. Furnish and install additional material required to complete relocation.

3.19 WATER SERVICE CONNECTIONS

- A. Work shall include all material for complete operation.
- B. This Work shall not begin until the proposed main has been tested, disinfected, accepted by the Engineer and is in operation.
- C. Services shall pass visual inspection by the Engineer, under system pressure prior to backfilling.
- D. Backfill according to Section 02223 - Backfilling.

3.20 FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of Section 01400 - Quality Control.

3.21 TESTING

- A. Pressure Leakage Test
  1. Perform after entire water main or a section between two valves has been installed and has passed the visual leakage test.
  2. Length of water main tested between two valves shall be the length of the entire water main or a maximum distance of 5,280 feet.
  3. Fill pipe slowly, expelling all air.
  4. Pressurize pipe to 150 psi and maintain for two hours.
  5. The amount of water added to maintain test pressure shall be defined as the leakage.
  6. Leakage shall not exceed 0.09 gallons per hour per inch of pipe diameter per 1000 feet of pipe.

7. Read line pressure on a 4 inch diameter gauge with snubber and a range of 0 to 200 psi in 2 psi increments as manufactured by Wika Instrument Corporation, or equal.
8. Measure water added to the pipe with a tested water meter connected to the water supply line.
9. For short sections of pipe, water may be added through a sterilized container and the amount calculated by direct measurement.
10. Find and repair leaks.
11. Flush pipe with potable water.

B. Visual Leakage Test

1. When directed by the Engineer, a visual leakage test may be performed in lieu of a pressure leakage test.
2. Place sufficient backfill to prevent pipe from buckling or shifting.
3. Joints remain exposed.
4. Restraints are installed.
5. Place and block test plug at the end of the pipe.
6. Fill pipe slowly with water expelling all air.
7. Increase water pressure to equal pressure from existing supply water main.
8. Visually inspect joints for leakage.
9. Repair leaks and repeat test.
10. Backfill after successful completion of test.

3.22 DISINFECTION

- A. Verify that water main is complete, flushed and clean.
- B. Inject disinfectant, chlorine solution, through a corporation cock inserted in the horizontal axis of the water main to a minimum water chlorine mixture of 25 parts per million of free chlorine.
- C. Inject at the beginning of the pipe line or a valved section.
- D. Slowly fill the line with potable water from the existing distribution line.
- E. Bleed water from a valve at the end of the line to ensure distribution and prevent pressure build up in excess of 20 psi.
- F. Maintain disinfectant in pipe line for 24 hours. At the end of the 24 hours, the free chlorine residual shall be no less than 10 parts per million. If less than 10 parts per million remain, inject additional chlorine until a residual of at least 10 parts per million remains after a subsequent 24 hour period.
- G. Flush disinfectant from pipe line.
- H. Engineer will verify disinfectant removal with DPD reagent.
- I. The Township, with assistance from the Contractor, will obtain samples for laboratory tests, a minimum of 24 hours after flushing the disinfectant from the pipeline, in accordance with AWWA requirements.
- J. Do not place water main into service until laboratory tests show satisfactory results in accordance with Michigan Department of Environmental Quality standards for safe drinking water.

- K. Repeat the complete disinfecting process if laboratory results deem the water unsafe for drinking.
- L. Replace corporation cocks with brass plugs when the disinfection process is complete and water is determined safe for drinking.
- M. The use of chlorine pills or tablets placed in the pipe during construction to be used in the disaffection process is prohibited.

3.23 SCHEDULES

- A. Pipe restraint:

<b>PIPE RESTRAINT SCHEDULE FOR GROUND BURIED PRESSURE PIPES<sup>1 2</sup></b>							
LENGTH OF RESTRAINT REQUIRED <sup>3</sup>							
Deflection Angle Pipe	22 1/2	33 3/4	45	56 1/4	67 1/2	78 3/4	90, tee or dead end
6"	8	12	16	20	25	31	59
8"	10	15	20	26	33	40	77
10"	12	18	25	32	40	49	93
12"	14	21	29	37	47	57	109
14"	16	24	33	41	54	66	125
16"	18	27	37	47	60	74	141
18"	20	30	41	53	67	82	157
20"	22	33	45	58	73	90	172
24"	25	39	53	68	85	105	202
30"	30	46	63	82	102	126	244
36"	35	54	74	95	119	146	283
42"	40	61	83	107	133	164	320
48"	44	67	92	118	148	181	356

END OF SECTION

<sup>1</sup> This table is based on a test pressure of 150 PSI (Operating pressure + water hammer). For other test pressures, all values shall be increased or decreased proportionally.

<sup>2</sup> Table is valid for depths of bury 5 feet or greater. For depths of bury less than 5 feet, consult D.I.P.R.A. guidelines.

<sup>3</sup> In each direction from point of deflection or termination, except for tee at which only the branch in the direction of the tee stem.